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COMETS OF 1892 AND THEIR SPECTRA.

By W. W. Campbell.

Discoveries of comets have been announced in quick succession the present year, eight having been found since March 7. Seven of these are now observable in one night with telescopic aid, which is very unusual. A list of them follows:

a. Discovered by Swift, March 7, in Rochester, N. Y. At discovery it was visible to the unassisted eye, and during April was a beautiful naked-eye object. When at its brightest, the tail was visible for 12° or 15° from the nucleus. It was observed spectroscopically on nine mornings in April, May and June. Its spectrum was of the usual type, continuous for the nucleus and banded for the coma and the tail. Accurate measures* and drawings of the less refrangible edge of the green band showed that interesting changes were taking place at that point. On several mornings the band was terminated by bright lines, but on other and intermediate mornings the bright lines were not present. The wave-lengths of the lines were 5170, 5164 and 5157; the smaller wave-lengths corresponding to greater distances from the Sun.

Another observation was made November 17. The spectrum was continuous, but was faint. A faint tail extended in the direction $p=250°\pm$, but its spectrum was not strong enough to be seen. It will be seen that the apparent direction of the tail was not away from the Sun, but the anomaly can doubtless be explained as an effect due to the comet's position and distance. The comet is at present in *Andromeda.*

c. Winnecke's Periodic Comet, discovered at Vienna, March 18. It is not now visible in small telescopes, and has not been bright enough for observations of its spectrum.

b. Discovered by Denning, March 18, in England. It is a very faint comet, and now difficult to observe. Its spectrum has not been observable.

d. Discovered by Brooks, August 28, at Geneva, N. Y. It is an easy object for small telescopes, growing rapidly brighter, but will soon be inaccessible in the southeast. Its spectrum is of the usual type, continuous for the nucleus, and the yellow, green and blue bands for the coma and tail. The wave-lengths of the less refrangible edges of the bands were 561, 5152, and 472 on November 17.

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* Published in detail in *Astronomy and Astro-Physics* for October, 1892. The work on *Mars* interfered with the observations of this comet.

e. Discovered by BARNARD, October 12, at Mt. Hamilton, with the CROCKER photographic telescope. It is probably a periodic comet of short period, and is now extremely faint. Its spectrum has been too faint to observe.

f. Discovered by HOLMES, November 6, in England. This is one of the most interesting comets of recent years. When discovered, about 2° southeast of the *Andromeda* nebula, it was easily visible to the naked eye. In the finder of the large spectroscope, magnifying about 700 diameters, it was seen on November 8 and 9 to be so sharply defined, rounded and dense that it seemed more like an immense planetary nebula than a comet.

The ordinary comet must be examined under low magnifying power, but this object easily bore a magnification of 700 times, and the structure of it was seen to good advantage. Near the center of the circular coma (5'.5 in diameter) was the usual nucleus, slightly elongated. Diverging from this, in a direction opposite to the Sun, was a quite dense fan-like structure which could be traced up to the edge of the coma, and even beyond the edge when the bright coma was just outside the field of view. This structure was the tail of the comet in embryo, which has since increased considerably in length. The apparent size of the comet has continually increased, until now its diameter is three or four times as great as when discovered.

Computers agree that it is not the lost BIELA comet, as was suspected at first, and that it is neither close to nor approaching the Earth. Its orbit is an ellipse, which seems to lie entirely outside the orbit of *Mars*.

The spectrum of the nucleus of an ordinary comet is continuous, showing that it, like the planets, is shining by virtue of reflected sunlight; while the spectrum of the coma and tail consists almost wholly of three or four bright bands which are sensibly identical with those given by the blue part of the ordinary gas or candle light. This part of the light is probably inherent in the comet.

The spectrum of HOLMES' comet is unique. All parts of it give a continuous spectrum; but, underlying this, there is certainly a trace of the green band. Photographs of the spectrum also show it to be continuous, but the wide slit employed leaves it in doubt whether FRAUNHOFER (dark) lines were present or not.

It is a remarkable coincidence that a bright comet should be observed near the radiant point of the BIELAN meteors, and that it should grow larger nearly at the time they were expected, and yet lie beyond the orbit of *Mars*, receding both from the Sun and from the Earth.

g. Discovered by BROOKS, Nov. 19, at Geneva, N. Y. No spectroscopic observations yet secured.

1892, November 28.

THE YERKES OBSERVATORY OF THE UNIVERSITY OF CHICAGO.*

GEORGE E. HALE, Director.

Through the munificence of CHARLES T. YERKES of Chicago, the University of Chicago is to have an astronomical observatory of the first class. Indeed, it is Mr. YERKES' express desire that in every particular the new observatory shall as nearly as possible attain the existing ideas of perfection. No definite limit has as yet been assigned to the expenditure contemplated, but the generosity of the donor is fully indicated by his wish that the completed observatory shall be second to none.

The aperture of the great telescope, which will form the central feature of the establishment, will shortly be decided upon in accordance with the condition that it must surpass that of the largest existing instrument—the 36-inch refractor of the LICK Observatory. It is probable that a size between 40 and 45 inches will be selected. A pair of 40-inch discs of glass, which were made some time ago for the University of Southern California, are now for sale, and these may possibly be obtained.

The mounting of the telescope is already under discussion, and its general features have been decided upon. The quick and

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* Abstract of an article in *Astronomy and Astro-Physics* for November, 1892.